

On a Larval Actinian Parasitic in a Rhizostome.

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With 3 Text-figures.

OUR knowledge of the medusophilous larval Actinians has been summarised by Haddon (1) and by McMurrich (2). The last-named author says: "The available evidence seems accordingly to point strongly in favour of the various medusophilous forms being the young stages in the development of *Peachia* rather than *Halcampa*; but a direct linking-up of the immature examples of *Bicidium*¹ with their respective adults is necessary to settle the question."

In this paper I will show that I have found the larvæ of *Peachia hilli* parasitic in a Rhizostome up to the stage in which they have been found free-living—thus linking up this medusophilous form with the adult. There is described, for the first time, the function of certain structures (the conchula and pores of the physa) found in *Peachia* larvæ, and their importance in connection with the parasitism of the widespread genus *Peachia* is emphasised. So far as I am aware, this is the first time that a larval Actinian has been described as parasitic in a Rhizostome. The parasitic larvæ hitherto described differ from the larvæ of *P. hilli* in this

¹ A genus in which he places these medusophilous forms.

respect—that they live either on the exterior of their host, or in the gut which opens freely by a mouth. The larvæ of *P. hilli*, however, live for a considerable period in the radial canals of a Rhizostome, from which they can only escape by perforating the body-wall of their host. This host is a large form, *Crambessa mosaica*, which is found in the land-locked harbours along the coast of New South Wales. This medusa is frequently found in large numbers, possibly brought together by currents and tidal action. At other times it is widely scattered. At all times it forms a very characteristic faunal element of the various inlets. So far as I can ascertain, it passes through its life-history in these waters.

Peachia hilli, the adult form of these larvæ, is found in Broken Bay, and was described by Miss Wilsmore (3) in 1911. She also described a free-living larval form, the internal anatomy of which showed that it was the larva of *P. hilli*.

The larvæ which are found parasitic correspond in their older stages with the larva found free-living, and so link up the medusophilous forms with the adult.

Character and Occurrence of Larvæ.

The larvæ are found in various parts of the large radial canals adhering to the ex-umbrella wall of the gut, excepting when they are making their way out of their host. I found them at various stages of development from 5 mm. to 40 mm. long. They occur in about every tenth medusa examined during the months of September and October, but by January it is rare to find them.

In October they were noticed in the act of escaping from their host, going through a hole, regular in outline, made in the sub-umbrella wall of the gut, near its periphery. I have found larvæ lying free in the gut, but near a hole, others actually filling up such a hole, with their œsophageal end protruding, and yet others, having effected their escape, adhering to the tentacles of their host. This latter condition

recalls the discovery in a similar situation of another and possibly closely related Actinian found by the Astrolabe Expedition (4) off the east coast of Australia in 1833, and recently investigated by Pax (5). The escaping larvæ varied in length from 20 mm. to 40 mm.

Description of Larvæ.

Both the adult and the larval form of *P. hilli* found free-living have been described by Miss L. J. Wilsmore from specimens obtained from Broken Bay by Prof. J. P. Hill.

In regard to the colour of the larva, the body is light amber, the œsophageal folds somewhat flesh-coloured or tawny, and the twelve tentacles have purplish-brown markings. There is a spot at the apex of each tentacle, and next to this is a line encircling the tentacle. The five markings which follow are V-shaped, and are on the œsophageal surface of the tentacle only. The colour of the apex of the V is weak or absent. There are no processes on the body resembling the suckers described by Haddon and Dixon (6) in the adult *P. hastata*; and neither while the larva is in its host nor "in vitro," have I seen any attempt on the part of the larva to attach itself except by its œsophageal folds.

There are two points which call for a further description, and which are, moreover, of considerable interest in connection with the parasitic life of the larva: I refer to the conchula and the pores present in the physa. Both of these structures are best studied in the living animal.

The Conchula and Pores of the Physa.

In the genus *Peachia* there is a single deep siphonoglyph. When the lips of the siphonoglyph come together, there is formed a tube which runs from the enteron to the exterior. In some species the external opening is surrounded by a complicated series of lobes, forming a conchula. In others the conchula is of a simpler nature.

McMurrich (2) gives a useful account of the conchula in the various species of *Peachia*. In the larva of *P. hilli* the peripheral ends of the lips of the siphonoglyph project as a pair of small processes (Text-fig. 2, *S.l.*), while from the base of the external opening there projects a median lobe. In this manner the conchula presents a simple three-lobed

TEXT-FIG 1.

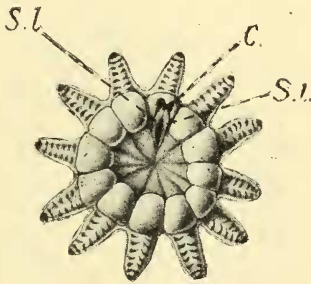


Drawing of a fully-extended, living larval specimen of *Peachia hilli* ($\times 1\frac{1}{2}$). The subject has been kept detached from its host for a few days and the conchula (C.) is somewhat contracted. The œsophageal folds and the character of the tentacles are seen. The grooves on the surface of the body are clearly shown and some of the pores of the physa. The trilobed character of the conchula is evident.

structure, such as appears to be the basis of the conchula of all species of the genus *Peachia*. Haddon (6), writing of *P. hastata*, says that the conchula varies greatly in complexity, but that "one basal, and two lateral lobes may

always be detected, which are larger and carry more secondary lobes than the remainder. The basal lobe forms a kind of lid or operculum to the siphonoglyph." An original observation which I have made is that, when the larva is attached by the œsophageal folds, it is through the conchula that a constant stream of fluid bearing food particles goes to the enteron. This fact I have made out by studying living larvæ which were still attached to the gut-wall of a Rhizostome. Correlated with the function of the conchula is the

TEXT-FIG. 2.

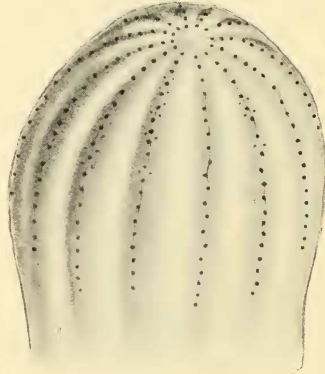


Drawing of the œsophageal surface of a living larval form of *Peachia hilli* ($\times 2$). The nature and markings of the tentacles are shown and the character of the œsophageal lobes. The conchula (C.) is seen to consist of a basal and two lateral lobes, the latter being borne by the lips of the siphonoglyph (S.L.), which are in contact near the periphery but slightly separated near the centre.

presence of a large number of pores in the physa. These pores were mentioned by Haddon (6) as occurring in *P. hastata* and included in his definition of the genus *Peachia* (7). They were noted by Miss Wilsmore (3) in sections and described by her so far as her material permitted. They are placed in the twelve external grooves of the physa, which, however, is not marked off from the scapus except in extreme contraction. There are generally twenty pores in each row arranged somewhat irregularly (Text-fig. 3). There is no central pore.

These pores are a conspicuous feature when the anemone is extended. The intake of fluid by the conchula is continuous, and as these pores, which lead from the interior of the animal, are widely opened at such times, I consider that they serve to carry away the fluid taken in by the conchula. So that, in the attached larva, there is a constant stream of water, bearing food particles, going into the interior of the anemone through the conchula, and a stream of water passing out through the pores of the physa. It would appear as if the conchula has been developed as a larval organ, correlated with

TEXT-FIG. 3.



Drawing of the physa of a living larval *Peachia hilli*, showing the character and arrangement of the pores as seen when the anemone is extended and the pores open.

the parasitic existence of the larval forms of the genus *Peachia*; and, associated with it, is the development of the pores of the physa.

The manner in which the medusophilous larvæ of Actinians take in their food has not been elsewhere described. Haddon (1), however, suggests that the form he described as the larvæ of *Halcampella chrysanthellum* detaches itself and floats in the water. Other authors assign this form to the genus *Peachia*. The deep siphonoglyph present has an external

opening (Haddon (8)), and when the anemone is attached, would, I take it, function as does the conchula of *P. hilli*.

McIntosh (9), writing of the parasitic larva of *P. hastata*, says:

“They appear to adhere to the medusa by the sucker-like action of the mouth, which is widely open, though the tentacles are closely applied to the surface. The free-swimming larval forms are thus, at a subsequent stage, carried about, without effort, by the medusæ, and as there is abundance of nourishment of a suitable kind around, it is not necessary to limit the view only to the possibility of their feeding on *Thaumantias*, for by the use of their tentacles as organs of attachment the mouth may, at any time, bes et free.”

My observations show that the larva of *P. hilli* adheres by the sucker-like action of the closely-applied œsophageal folds—the closed lips of the siphonoglyph completing the sucker—and that the tentacles are not brought into use. The larva is always found adhering in this way, save when escaping from its host, and it is through the conchula that the food is taken in.

I am tempted to put forward the hypothesis that the larvæ of the widespread genus *Peachia* are all medusophilous, and that the single deep siphonoglyph, possessing as it does an opening below the œsophageal folds, is a larval organ, correlated with such parasitism. The development of a conchula, as a series of processes round the external opening, is seen in the older larvæ.

In support of this hypothesis I would draw attention to the distribution of the larval forms—of *Peachia hilli* parasitic in *Crambessa mosaica* on the EAST COAST OF AUSTRALIA; of *Peachia parasitica* on *Cyanea arctica* in the NORTH ATLANTIC; of *Peachia hastata* on various medusæ in the NORTH SEA; and of *Bicidium aequoreae*, the probable larval form of *P. quinquecapitata*, off the coast of BRITISH COLUMBIA.

In regard to the second and third forms, McMurrich (2)

prefers to place these larvæ in the genus *Bicidium*, until they are proved to develop into the adult *Peachia*. He regards the occurrence of *P. quinquecapitata* in the same locality as *Bicidium aequoreae* as suggestive, and considers it not improbable that their differences are due to age.

It is to be noted that there are so far described, according to McMurrich (2), seven species of *Peachia*, and these, together with an eighth species described by Miss Wilsmore (3), are as widely distributed as the medusophilous Actinian larvæ.

In conclusion, it would seem that the parasitism of these larvæ is only compatible with the presence of a deep siphonoglyph having an external opening or conchula, and such a structure is possessed only by the genus *Peachia*, if we except the little-known genus *Actinopsis*, which is said to possess a double conchula.

I wish to thank Prof. Haswell, in whose laboratory this work was done, for his kind help and advice.

The figures were re-drawn by Mr. F. W. Atkins, of the Sydney Technical High School.

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